SUBJ: **COMMUNICATIONS DIVERSITY**

1. **PURPOSE.** This order establishes the national guidance to reduce vulnerability of critical National Airspace System (NAS) telecommunication services to single points of failure. It defines and assigns priorities to diversity requirements and establishes regional communications working groups (CWG).

2. **DISTRIBUTION.** This order is distributed to division level in NAS Operations, Air Traffic Operations, and Air Traffic Plans and Requirements in Washington headquarters; to section level in the regional Airway Facilities and Air Traffic divisions; and to all Airway Facilities and Air Traffic field office with a limited distribution.

3. **CANCELLATION.** Order 6000.36, Communications Diversity, dated March 20, 1990, is canceled.

4. **BACKGROUND.** Recent service interruptions have had a serious operational impact resulting in delays in the movement of air traffic. Outages that affect multiple circuits (that support several different services) have impacted air traffic operations severely. System interruptions of this nature have given rise to the issue of diversity within the network. Existing guidance, methods, procedures, and the current level of diversity do not meet the FAA service availability requirements. Industry trends toward multiplexing circuits have increased the risk of single points of failure causing multiple outages. By judicious planning and engineering, this risk can be minimized and alternate service paths provided.

5. **EXPLANATION OF CHANGES.** Significant changes are as follows:

    a. **Adds language** that Telco-provided automatic restoral switching systems satisfy the diversity requirements of this order.

    b. **Makes establishment** of regional CWG's optional. If CWG's are not established and chartered, regions will identify an organization assigned the responsibility for diversity. References to the National Oversight Committee were deleted.

c. **Changed language** to provide regions more flexibility to implement diversity requirements.

d. **Provided greater detail** in defining dual entrance routing.

6. DEFINITION OF TERMS.. The following definitions are needed to fully apply the requirements of this order. Appendix 2 contains definition of Telecommunications Services

a. **Primary System.** Provides a service that satisfies the day-to-day requirements of the FAA and includes both main and standby equipment.

b. **Emergency System.** Provides a service independent of the primary main or standby equipment including telecommunications path, buildings, etc.

c. **Frequency Diversity.** That form of diversity that utilizes different frequencies.

d. **Space Diversity.** That form of diversity that utilizes antennas placed at different physical locations.

e. **Media Diversity.** Leased services shall only have one path utilizing radio/microwave. FAA systems that use radio/microwave for both paths must use frequency and/or space diversity.

f. **Last Mile.** Transmission media from the last network access point to the facility.

g. **Alternate Route Switching.** Path selection using automatic or manual switching from one transmission route to an alternate transmission route.

h. **Single Point of Failure.** Any point (electrical or physical) within the system, failure of which will cause loss of service.

i. **Alternate Route.** Different transmission path, not necessarily electrically or physically separated.

j. **Avoidance.** A circuit that avoids a specified geographic location.

k. **Service Diversity.** Services provided via alternate sites; e.g., overlapping radar coverage.

1. **Circuit Diversity**. Physical separation of outside dual route or loop cable systems (leased and FAA) shall be a minimum of 25 feet. Building penetrations should be separated by 25 feet unless the building is too small, then penetrations should be through opposite exterior walls if possible. Routing inside non-FAA controlled building space should be as physically separated as possible until entering FAA controlled space. A physical and electrical separation in routing of transmission paths such that a failure at one geographical location will not cause the loss of both paths.

> NOTE: These definitions are different from those used by Telco and are defined here to describe FAA requirements for service. These definitions are included to provide a commonality of language in establishing regional service diversity plans.

7. **SCOPE**. This order establishes minimum criteria to be used in providing diversity for telecommunications services, thus reducing the vulnerability to single points of failure. The guidelines within allow for usage of modern technology and resources which, when implemented, will make the system less vulnerable to outages, especially those that result in the loss of multiple critical service. This order:

   a. **Establishes service/circuit diversity requirements**, as a means of improving availability, for a selected group of critical services.

   b. **Establishes priorities** within the selected group of critical services for establishment of diversity.

   c. **Sets guidance** for establishing function or service diversity.

   d. **Charters regional** CWG's on an optional basis to analyze existing and anticipated telecommunications service reliability and make recommendations for improvement; and develop regional diversity plans.

   e. **Requires development** of regional communications diversity plan.

8. **OPERATIONAL AVAILABILITY REQUIREMENTS**. The following are the criticality levels and the service availability and restoral time requirements for each as defined by the National Airspace System, System Requirements Specification, NAS-SR-1000.

Levels	Availability	Restoration Time
Critical	.99999	6 seconds
Essential	.999	10 minutes
Routine	.99	1.68 hours

a. **Critical.** Functions or services which, if lost, would PREVENT the NAS from exercising safe separation and control over aircraft.

b. **Essential.** Functions or services which, if lost, would REDUCE the capability of the NAS to exercise safe separation and control over aircraft.

c. **Routine.** Functions or services which, if lost, would NOT SIGNIFICANTLY DEGRADE the capability of the NAS to exercise safe separation and control over aircraft.

9. ACTION.

a. **Critical services requiring diversity are listed in Appendix 1, NAS Services Requiring Diversity.** Priority levels have been assigned for use in planning and resources allocation in establishment and implementation of regional diversity plans. These priorities shall be used in the event that budgetary limitations cause full implementation to be delayed or spread over more than one fiscal year. These priorities do not preclude regions from providing diversity for services that are not listed in appendix 1 or for individual facility services, e.g., XYZ remote tower radar display where telecommunications interruptions have prevented or are anticipated to prevent the NAS from exercising safe separation and control over aircraft.

b. **Regions will establish CWG's** to address diversity issues on an optional basis. If CWG's are not established and chartered, regions will clearly define the organization that is responsible for performing the functions of the CWG's, i.e., ensure that diversity requirements and plans are developed, funded, and implemented.

c. **All services listed in appendix 1 will provided** diversity utilizing service and/or circuit diversity as defined in paragraph 6. The NAS-SR-1000 requirements for availability and restoration times are for the end-state design. The end-state will include many new systems which will be specified to meet NAS-SR-1000 requirements. Without these systems, the restoration and availability of the end-state cannot be achieved. Vendor provided automated restoral switching such as Leased Interfacility NAS Communications System (LINCS) backbone, Alaska NAS Interfacility Communications system (ANICS), or other equivalent systems will satisfy the transmission path diversity requirements of this order. Recognizing that equipment currently in place may not perform to end-state requirements, telecommunication designs should attempt

to achieve the most reliable service performance through the use of system/circuit configurations,which utilize diversity to the extent possible, given current technological and cost considerations. A determination of existing NAS services diversity and system/circuit configurations compliance to this order shall be made by the regional CWG as approved by the chairperson. Architectural models to aid in developing regional communications diversity plans are provided in the Appendix 3, The Regional CWG Charter. This order shall apply to all new requests.

d. **Exceptions/Waivers.** Any exceptions to this order, such as technological or cost considerations must be jointly approved by the regional Airway Facilities and Air Traffic division managers and forwarded to Telecommunications Network Planning and Engineering Division, AOP-400, for action.

e. **AOP-400** will provide guidance and clarification on matters relating to this order. This responsibility also includes coordinating and taking final action on requests for exceptions/waivers to the requirements of this order and regional diversity plans, and providing overall guidance for the regional CWG's.

f. **Regional CWG's,** under guidance of this order, shall develop regional communications diversity plans for all air traffic control center's pacer airports, other level 5 air traffic control facilities, and the flight service data processing system (FSDPS) services to automated flight service stations (AFSS). These facilities/services should be addressed as the first priority.

Joaquin Archilla
Director of Airway Facilities

APPENDIX 1. NAS SERVICES REQUIRING DIVERSITY

PRIORITY 1

CONNECTIVITY	SERVICE	TYPE
ACF to RCF	ECOM	VOICE
CERAP to RCF	ECOM	VOICE
ARSR to ACF	RDAT/BDAT	DATA
ARSR to CERAP	RDAT/BDAT	DATA
ACF to ARINC	SVFB	VOICE
ACF to RCF	TCOM	VOICE
ATCT to RCF	TCOM	VOICE
CERAP to RCF	TCOM	VOICE
TRACON to RCF	TCOM	VOICE
ASR to ACF	TRAD/TSEC	DATA
ASR to CERAP	TRAD/TSEC	DATA
ASR to TRACON	TRAD/TSEC	DATA

PRIORITY 2

ACF to ACF	IDAT	DATA
ACF to CERAP	IDAT	DATA
ACF to TRACON	IDAT	DATA
ACF to ARINC	ODAP	DATA
ACF to ACF	SVFA	VOICE
ACF to CERAP	SVFA	VOICE
ACF to TRACON	SVFB	VOICE
ATCT to TRACON	SVFC	VOICEA
ASR to ATCT	TRAD/TSEC	DATA

PRIORITY 3

ACF to ATCT	FDAT	DATA
ACF to CERAP	FDAT	DATA
ACF to MIL ATCT	FDAT	DATA
ACF to TRACON	FDAT	DATA
ACF to AFSS	FSAD	DATA
ACF to ATCT	IDAT	DATA
ACF to MIL ATCT	IDAT	DATA
ACF to ATCT	RTAD	DATA
ATCT to CERAP	RTRD	DATA
ACF to ATCT	SVFB	VOICE
ACF to MIL ATCT	SVFB	VOICE
ATCT to CERAP	SVFB	VOICE
ACF to INTL DMARC	SVFD	VOICE
CERAP to INTL DEMARC	SVFD	VOICE

(1) ACF equates to ARTCC in today's NAS.
(2) RCF equates to RCAG, RTR, and RCO in today's NAS.

APPENDIX 2. DEFINITIONS OF TELECOMMUNICATIONS SERVICES

O-Other
E-Enroute
T-Terminal
F-FSS/WX
U-Communications Utilities

BDAT (E)   **Digitized Beacon Data.** The beacon system interrogates the aircraft and receives signals transmitted from airborne transponders that are coded replies to the air traffic control beacon interrogator/air traffic control radar beacon (ATCRB) discrete addressable secondary radar system with data (MODE S) interrogations. The transponder information may include aircraft identification and altitude. The beacon system is currently the main source of surveillance information used for air traffic control (ATC).

ECOM (E)   **En Route Communications.** Radio communications between the ARTCC and in-flight aircraft.

FDAT (T)   **Flight Data Entry and Printout Service.** Flight data information between ARTCC's and terminal facilities.

FSAD (F)   **Flight Service Automated Data.** Data associated with AFSS's.

IDAT (E)   **Interfacility Data Service.** Data exchange between ATC computers with one end being the ARTCC central computer complex.

ODAP (E)   **Oceanic Display and Planning.** Provides automation assistance for oceanic ATC.

RDAT (E)   **Digitized Radar Data.** En route digitized radar data used by ARTCC controllers. The data are presented at the ARTCC and combined center/radar approach control (RAPCON) locations. Data from the ARSR's are used by the ARTCC to detect and display an aircraft's en route position between terminal areas. The nominal range of each ARSR is 200 miles. The common digitizer (CD) accepts data in analog form from the radar and beacon sites and converts the data to digital (narrow band) form. The data are then transmitted over the radio microwave link/radio communications link and/or commercial lines to the ARTCC.

RTAD (T)   **Remote Tower Alphanumeric Display.** RTRD with alphanumeric and processing information.

RTRD (T)   **Remote Tower Radar Display.** Raw primary radar/beacon analog data to remote tower facilities.

APPENDIX 2. DEFINITIONS OF TELECOMMUNICATIONS SERVICES (CONTINUED)

SVFA (E) **Service F Interphone (Center to Center).** Interphone service among ARTCC's.

SVFB (E) **Service F Interphone (Center to Terminal).** Interphone service among ARTCC's and non-ARTCC facilities.

SVFC (T) **Service F Interphone (non-ARTCC to non-ARTCC).** Interphone service between two non-center facilities.

SVFD (O) **Service F Interphone.** Miscellaneous interphone service.

TCOM (T) **Terminal Communications.** Air/ground voice communications related to ATC facilities such as air traffic control tower's, telephone company, and RAPCON's.

TRAD (T) **Terminal Radar Service.** Primary broadband analog data provided by airport surveillance radar.

TSEC (T) **Terminal Secondary Radar Service:** Analog beacon data provided by ATCRB and MODE S equipment.

APPENDIX 3. WORKING GROUP CHARTER

1. **AUTHORITY.** This order establishes the AXX Regional Communications Working Group (CWG), authorizes its existence, and supports its activities.

2. **PURPOSE.** The purpose of the AXX regional CWG is to provide a program management and oversight function for the coordination and implementation of FAA communications projects in the region. The CWG will serve as the focal point for the development and maintenance of the communications diversity plan and diversity implementation plan which encompass all communications activities in the region.

3. **OBJECTIVES.** The AXX Regional CWG will:

   a. Assess current ATC En route (ARTCC), Pacer Airports, and other level 5 terminal environments for all critical voice/data services. Assess the current diversity situation. Identify those services not in compliance with this order. Initially, prioritize assessment and subsequent development of diversity plans in the following sequence: ARTCC, Pacer Airports, and other level 5 terminals. Identify high vulnerability, single point of failure locations where failures are likely to occur.

   b. Oversee the development/update of the regional communication diversity plan(s), incorporating all diversity, redundancy, emergency and coverage requirements for the optimum configuration. Provide an annual review cycle for the plan(s)

   c. Oversee development of network configurations to meet requirements. Evaluate feasibility, conduct cost vs. benefit analysis, identify resources required, and set priorities for implementation. Develop budget submissions (including statement of essential need; i.e., impact statement). Any new switching systems planned to facilitate diversity shall be coordinated with AOP-400 and obtain national approval of the design.

   d. Develop and maintain a regional communications diversity implementation plan. The purpose of the plan is to provide guidance for managing and coordinating the communications activities necessary to support communications diversity requirements during the NAS upgrade and beyond.

APPENDIX 3. WORKING GROUP CHARTER (CONTINUED)

The initial communications diversity and diversity implementation plans will address the priority facilities and high vulnerability single point of failure locations. Follow-on plans will extend to all end-to-end considerations including "last mile" problems not fully addressed in the initial plan.

e. Promote and initiate local requirements for periodic tests of equipment and circuits to ensure that diversity is maintained.

4. **OPERATION.**

a. **Membership.** The suggested members of the CWG will represent the following regional functions:

(1) The permanent members are:

Telemmunications Support (Chair Organization)

Air Traffic Requirements

F&E Planning and Programming

F&E Engineering

Maintenance Operations

Spectrum Engineering

Air Traffic Field Facility

Airway Facilities Sector

(2) The ad hoc members are:

Telephone Company Regional Service Representative

Support Contractor

(3) Other organizational functions which are not represented by permanent or ad hoc members in the working group, but which have a vested interest in the proceedings, will be called upon to participate in meetings from time to time. These participants will be provided agendas, as appropriate, and may participate in discussions and submit and/or be assigned action items.

APPENDIX 3. WORKING GROUP CHARTER (CONTINUED)

b. **Meetings.** The CWG will meet on an as required basis as determined by the chairperson.

c. **Documentation.** Working group documentation shall include, but not be limited to:

    (1) **Agenda.** An agenda will be prepared for each meeting, and will be distributed to members prior to the meeting in sufficient time to allow the members to review and accomplish any required research and review.

    (2) **Minutes.** Minutes of each meeting will be prepared and distributed to each member, to Systems Plans and Program Division ATR-100, and AOP-400.

    (3) **Action Items.** Action items identified, assigned, and/or resolved during meetings will be included in the minutes of the group proceedings.

    (4) **Recommendations.** Recommendations for waiver of diversity shall be signed by regional AF and AT division managers.

    (5) **Communication Diversity Plan.** These plans shall identify highly vulnerable locations and provide alternate network/circuit designs to meet diversity guidance.

    (6) **Diversity Implementation Plan.** This plan shall be developed and updated to guide the implementation of service diversity including budget estimates, implementation schedules, milestones, and delegations of responsibilities.

5. **ARCHITECTURAL MODELS.** Application notes:

a. The architectural drawings are for guidance in demonstrating possible ways of achieving diverse transmission paths and improved service availability. They are not an exhaustive set, other configurations are possible.

b. Dial backup may be used to provide diversity where other methods are not cost effective.

APPENDIX 3.   WORKING GROUP CHARTER (CONTINUED)

c.   The results of the FAA studies of communications
     delay will determine the applicability of the use
     of satellites in providing a transmission path as
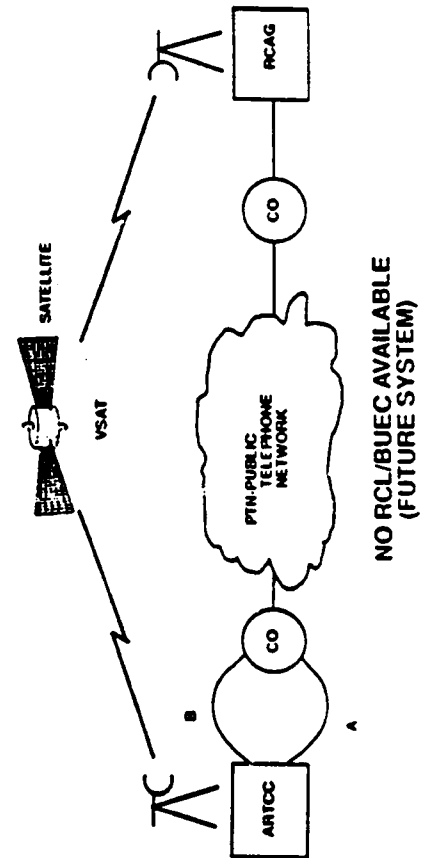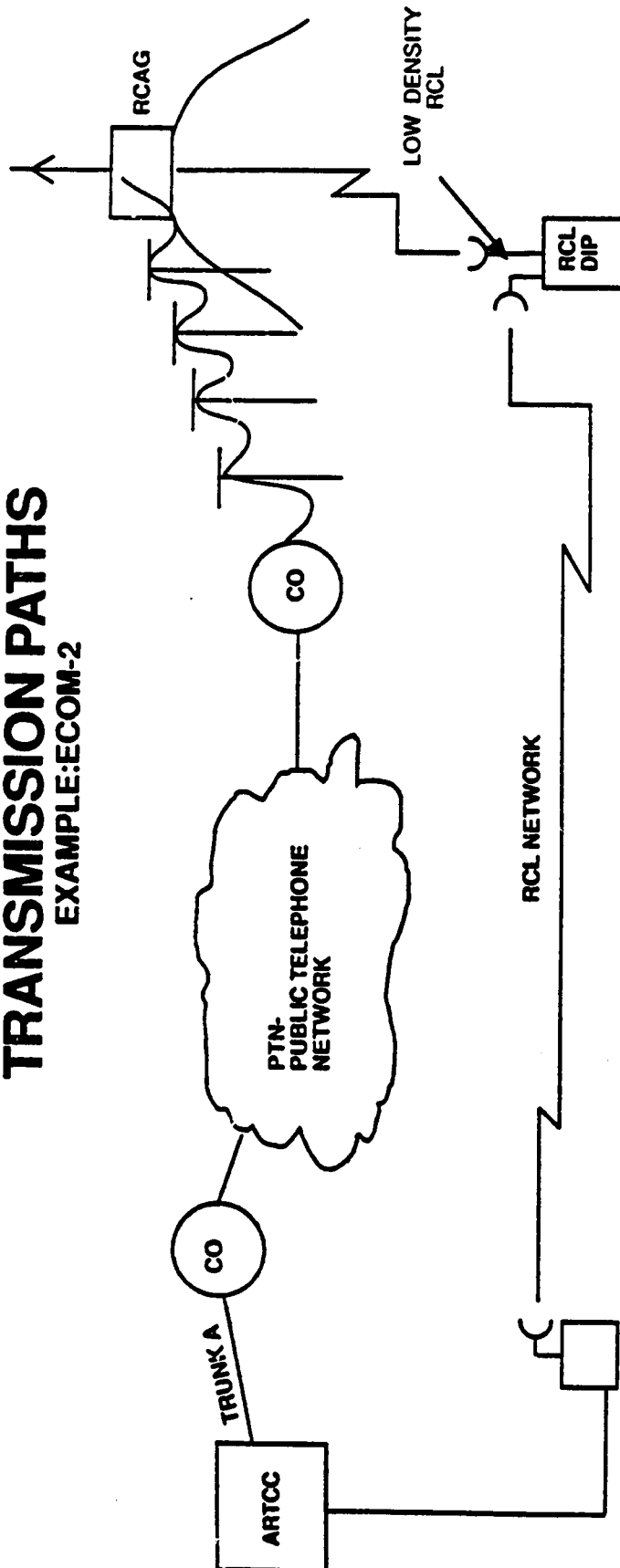   shown on these models.

TYPICAL RCAG TRANSMISSION PATHS
EXAMPLE: ECOM-1
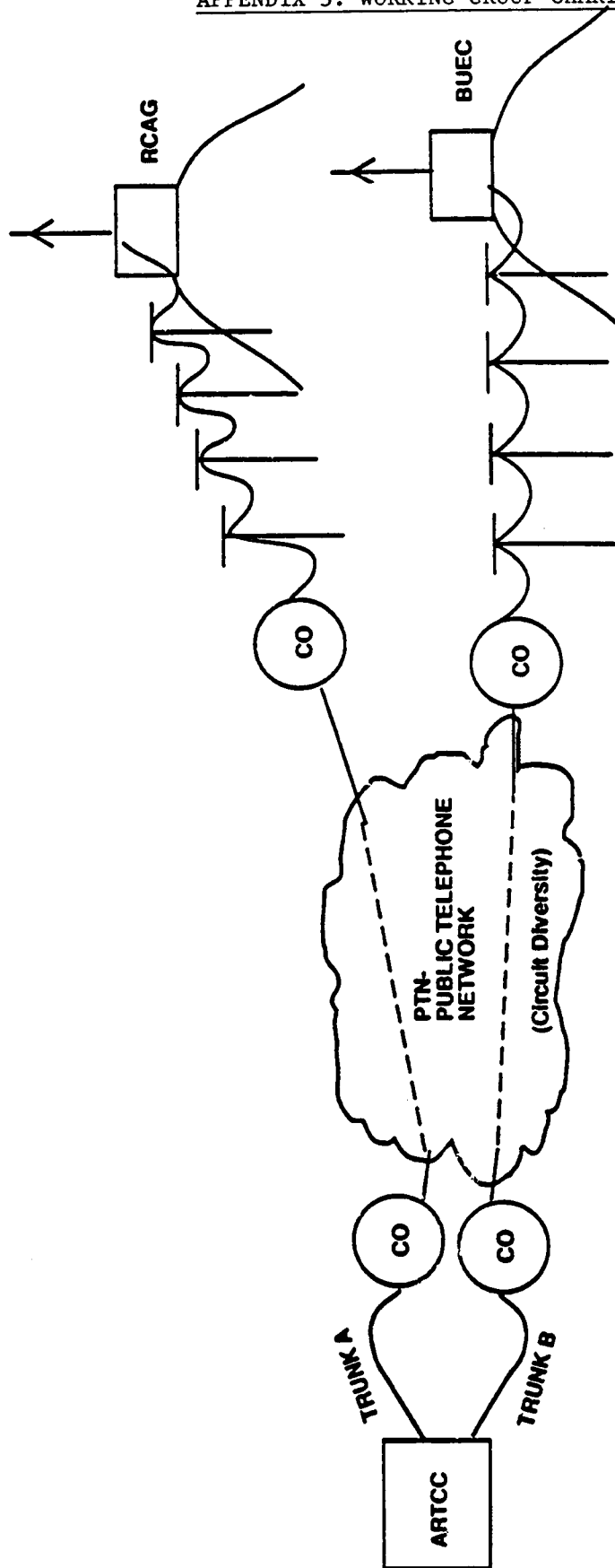
**DUAL-POINT ENTRY TO PTN
FULLY DIVERSE
WITH BUEC COVERAGE**

- PRIMARY PATH THRU PTN TO RCAG
- SECOND PATH THRU PTN WITH DIVERSITY TO BUEC
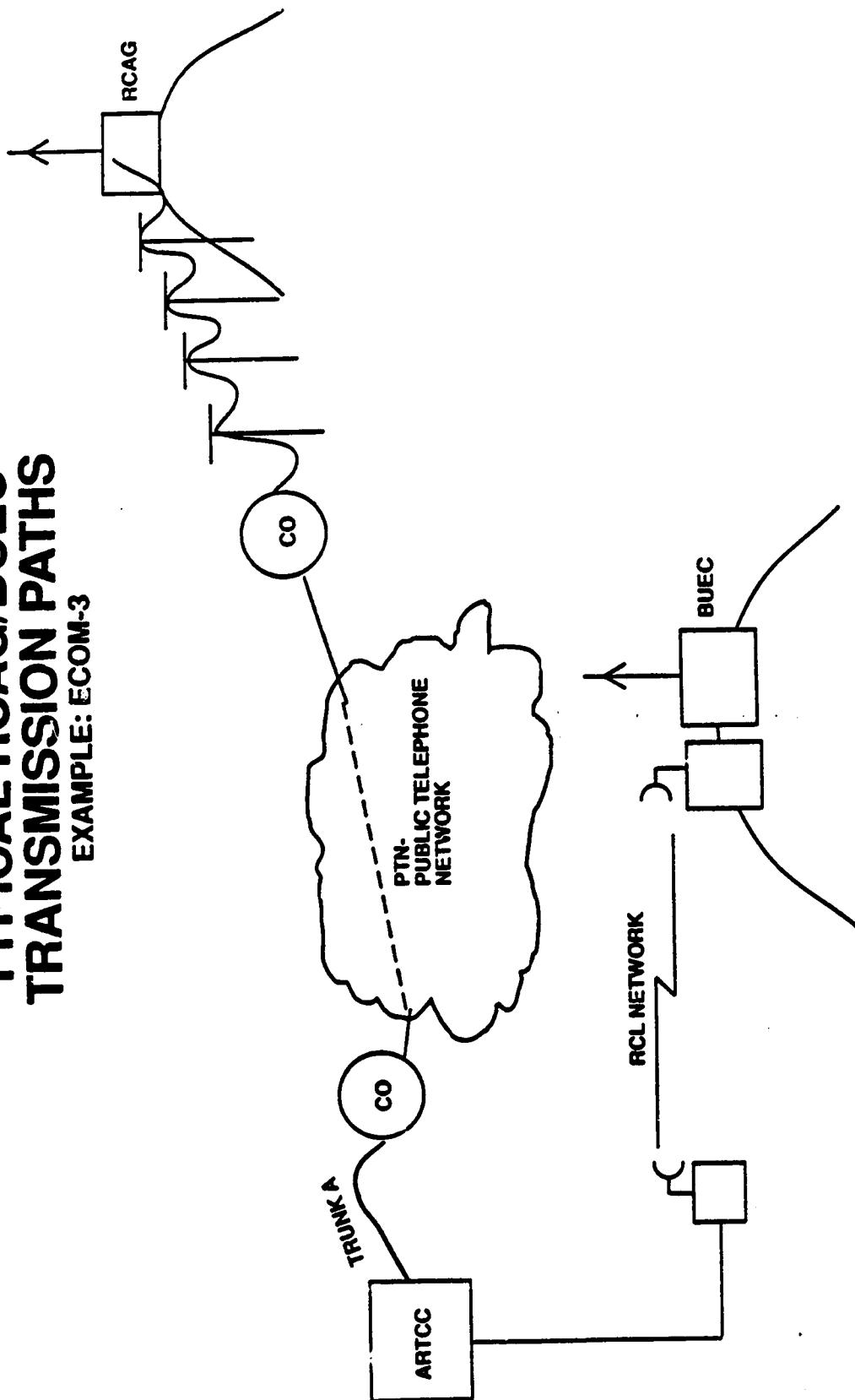
TYPICAL RCAG
TRANSMISSION PATHS
EXAMPLE:ECOM-2

RCAG

LOW DENSITY
RCL

RCL
DIP

SATELLITE

VSAT

RCAG

CO

PTN-PUBLIC
TELEPHONE
NETWORK

NO RCL/BUEC AVAILABLE
(FUTURE SYSTEM)

CO

ARTCC

CO

PTN-
PUBLIC TELEPHONE
NETWORK

RCL NETWORK

TRUNK A

CO

ARTCC

SINGLE POINT ENTRY TO PTN
FULLY DIVERSE SECONDARY,
NO BUEC COVERAGE AVAILABLE

• PRIMARY PATH TO RCAG THRU RCL/LDRCL
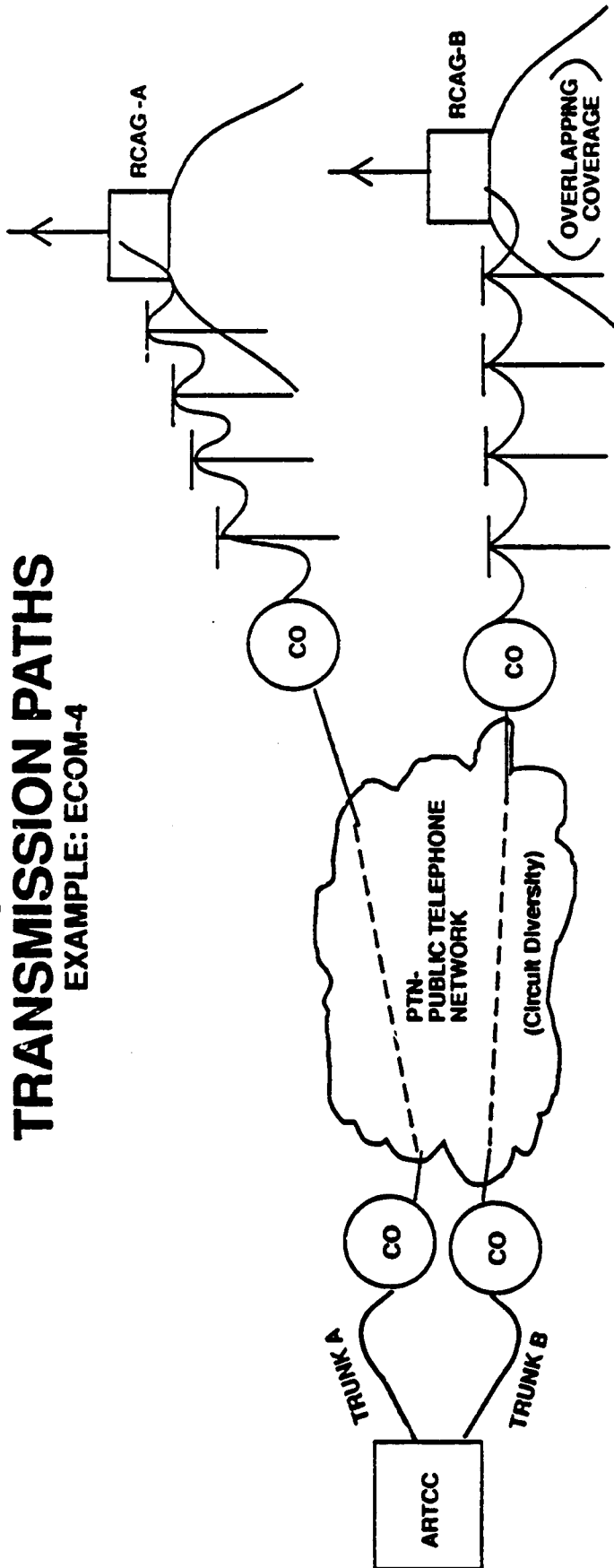
• SECONDARY PATH TO RCAG THRU PTN

TYPICAL RCAG/BUEC TRANSMISSION PATHS
EXAMPLE: ECOM-3

RCAG

CO

PTN-
PUBLIC TELEPHONE
NETWORK

CO

TRUNK A

ARTCC

RCL NETWORK

BUEC

SINGLE-POINT ENTRY TO PTN
FULLY DIVERSE OVERLAPPING
COVERAGE, BUEC CO-LOCATED
WITH RCL

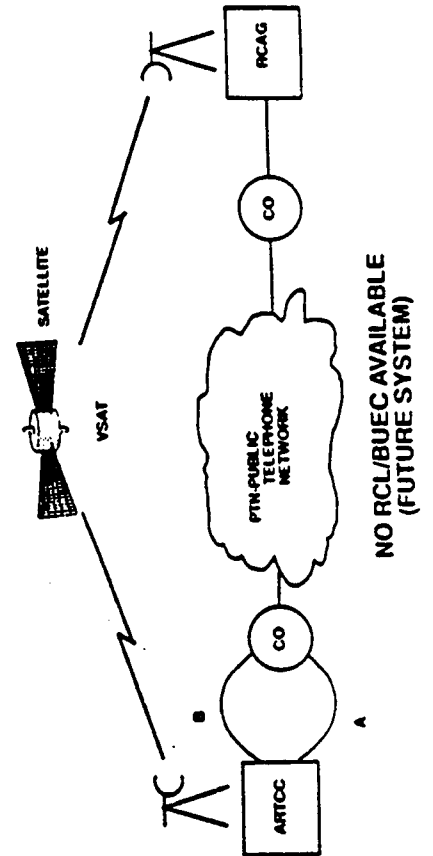- PRIMARY PATH THROUGH PTN TO RCAG
- SECOND PATH THROUGH RCL TO BUEC

TYPICAL RCAG TRANSMISSION PATHS
EXAMPLE: ECOM-4

RCAG-A

RCAG-B

(OVERLAPPING COVERAGE)

CO

CO

PTN-
PUBLIC TELEPHONE
NETWORK

(Circuit Diversity)

CO

CO

TRUNK A

TRUNK B

ARTCC

DUAL-POINT ENTRY TO PTN
FULLY DIVERSE
OVERLAPPING COVERAGE

• FREQUENCY DIVERSITY
  OR
• SPACE DIVERSITY OF MAIN STANDBY

TYPICAL RCAG/BUEC TRANSMISSION PATHS
EXAMPLE: ECOM-5

RCAG

BUEC

CO

CO

PTN-
PUBLIC TELEPHONE
NETWORK

DIVERSE PATH

RCL
DIP

CO

RCL NETWORK

CO

TRUNK A

ARTCC

SATELLITE

VSAT

RCAG

CO

PTN-PUBLIC
TELEPHONE
NETWORK

CO

ARTCC

A

B

NO RCL/BUEC AVAILABLE
(FUTURE SYSTEM)
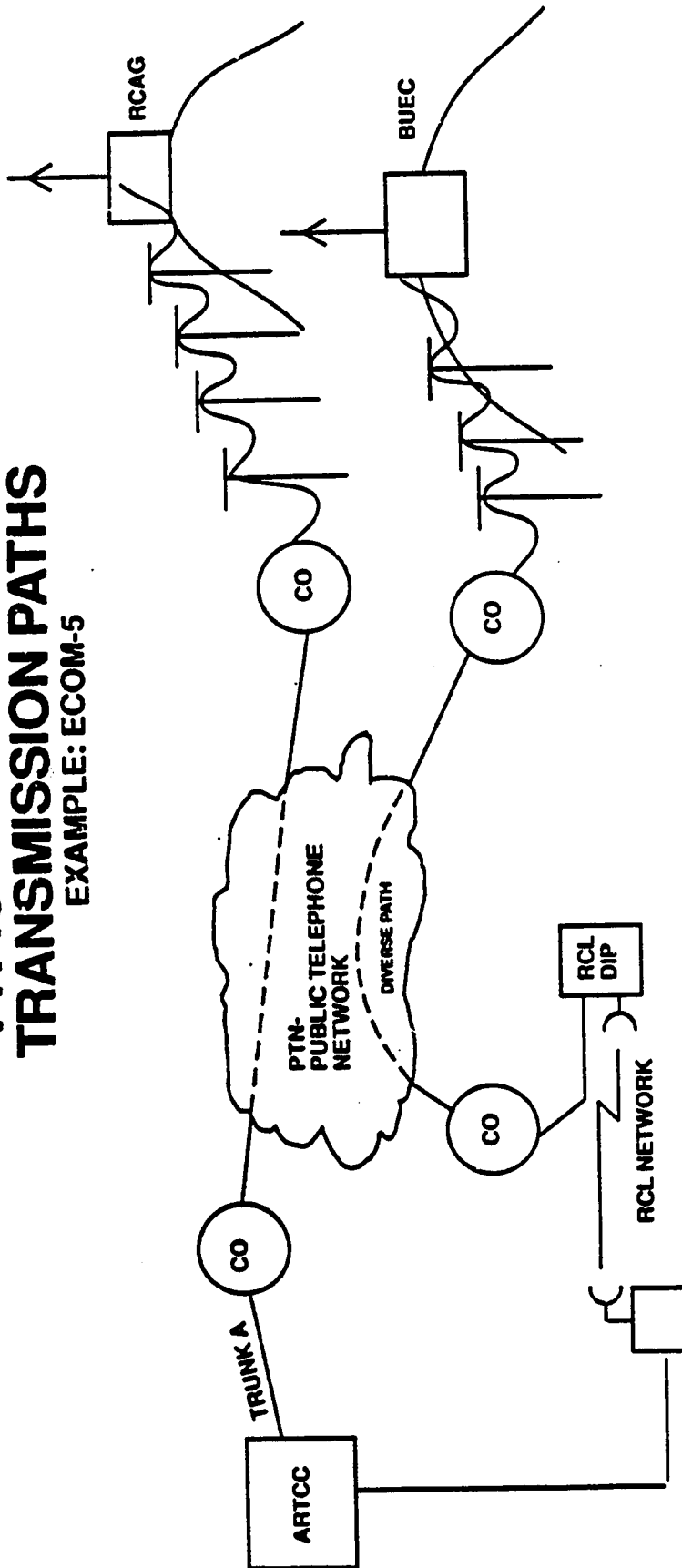
FULLY DIVERSE SECONDARY RCAG/BUEC

- PRIMARY PATH THROUGH PTN

- SECONDARY PATH THROUGH RCL/PTN
  WITH DIVERSITY FROM PRIMARY

RDAT/BDAT–LRR SERVES SINGLE ARTCC
EXAMPLE: LRR-1

RCL NETWORK

PTN-PUBLIC TELEPHONE NETWORK

ARTCC   B   A   CO

CO   LRR

SATELLITE

VSAT

PTN-PUBLIC TELEPHONE NETWORK
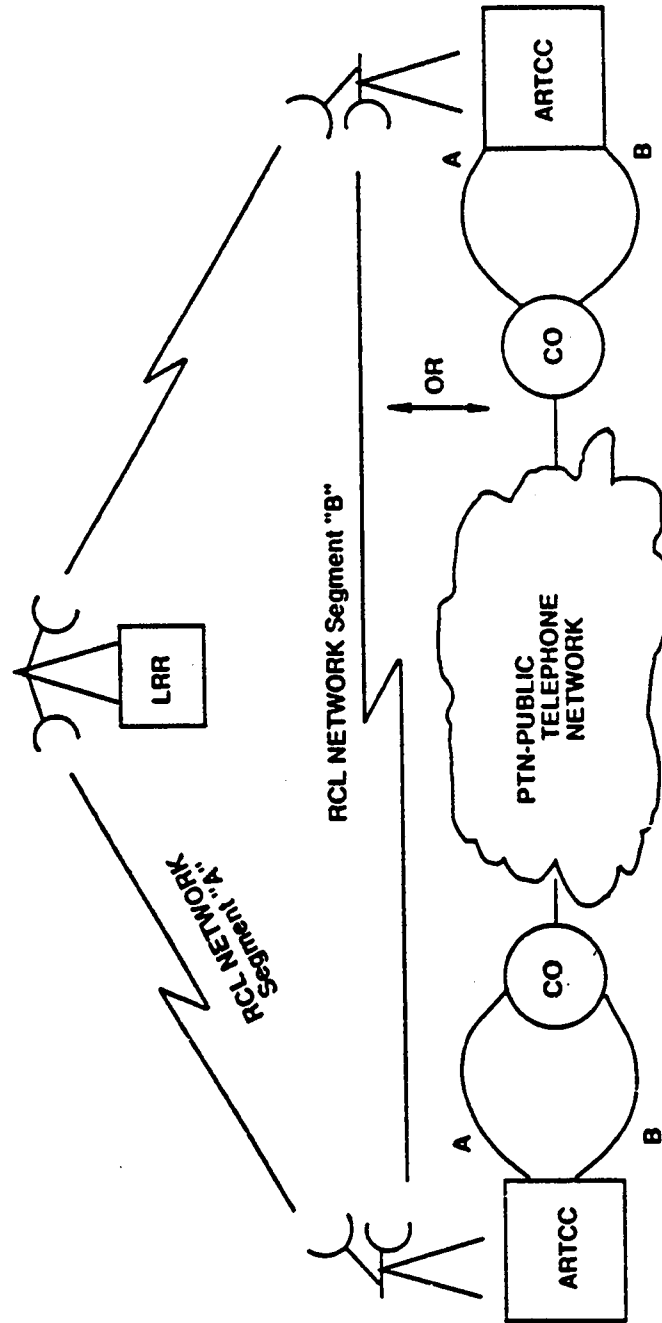
CO   LRR

ARTCC   B   A   CO

NO RCL AVAILABLE
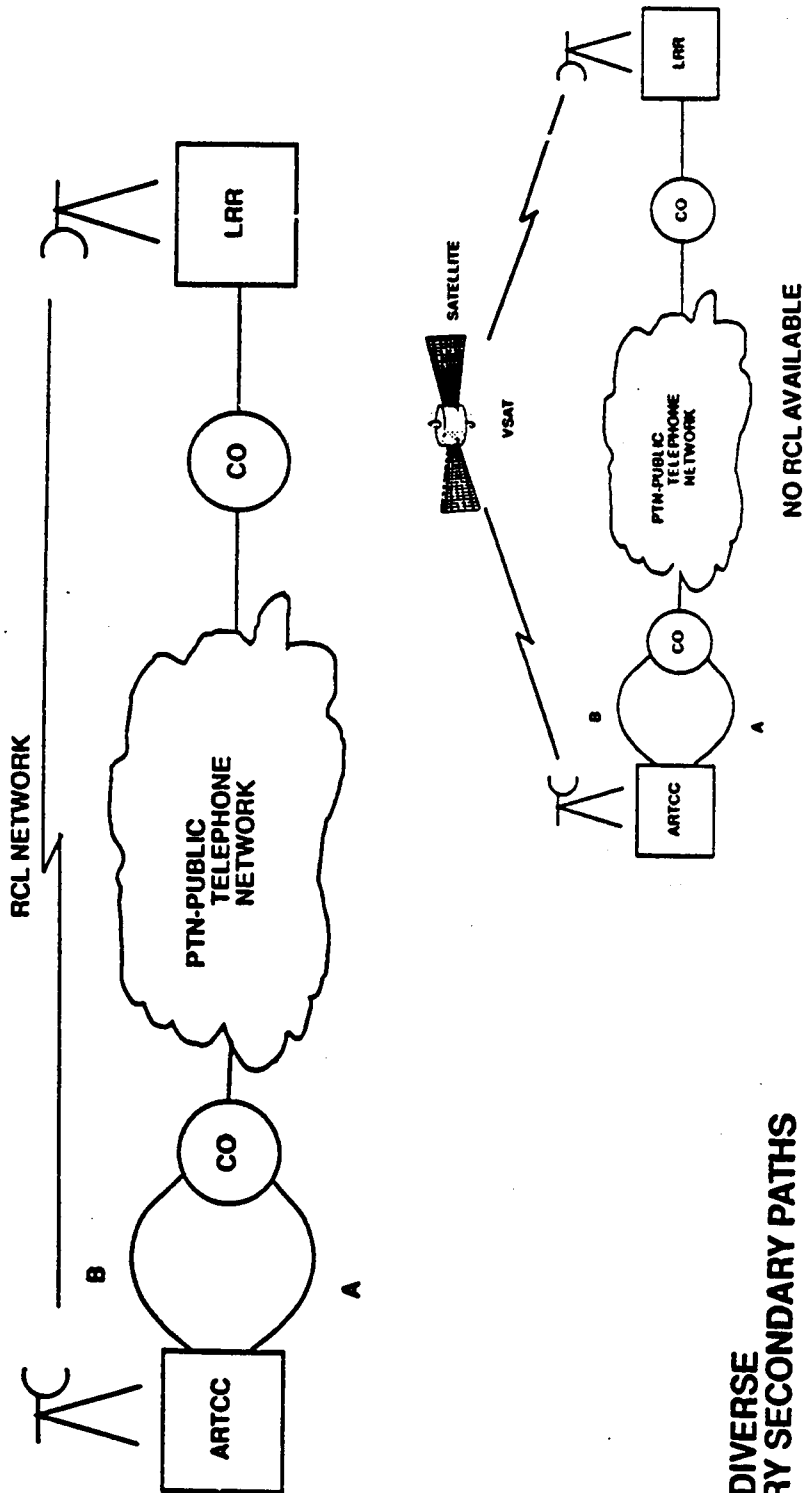
FULLY DIVERSE
PRIMARY SECONDARY PATHS

- PRIMARY PATH THROUGH A RCL CIRCUIT
  VIA 3 MODEM PORTS
- SECOND PATH THROUGH LEASED CIRCUITS
- MANUAL PATCHING REQUIRED
  OR
- PRIMARY THROUGH A LEASED CIRCUIT
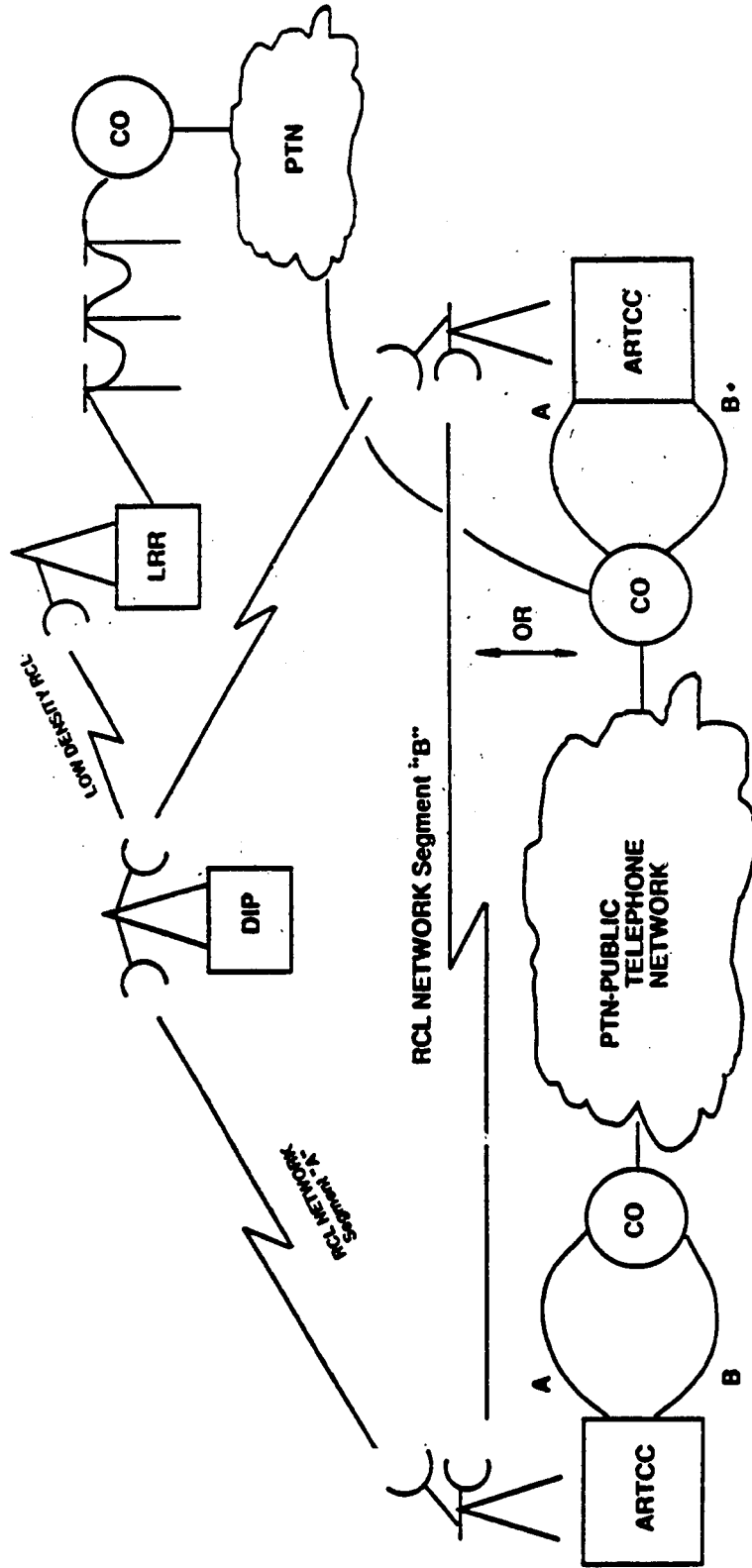 + SECONDARY PATH PROVIDED BY VSAT

APPENDIX 3. WORKING GROUP CHARTER

RDAT/BDAT-LRR SHARED BY TWO ARTCC'S
EXAMPLE: LRR-2

ARTCC

ARTCC

A

B

CO

OR

CO

PTN-PUBLIC
TELEPHONE
NETWORK

LRR

RCL NETWORK Segment "B"

RCL NETWORK
Segment "A"

A

B

ARTCC

FULLY DIVERSE TRANSMISSION PATHS FOR PRIMARY AND SECONDARY

- PRIMARY PATH THROUGH TO RCL CIRCUIT
  TO TWO ARTCC'S
- SECOND PATH THROUGH ADJACENT ARTCC SHARING
  THE SAME RADAR
  (LEASED CIRCUIT OR DIFFERENT RCL SEGMENT)
- MANUAL PATCHING REQUIRED IF ARTCC'S SHARE MORE
  THAN ONE RADAR

RDAT/BDAT-LRR SHARED BY TWO ARTCC'S ON AN RCL SPUR
EXAMPLE: LRR-3

CO

PTN

LRR

DIP

LOW DENSITY RCL

RCL NETWORK Segment "A"

RCL NETWORK Segment "B"

OR

CO

ARTCC

A

B•

CO

PTN-PUBLIC TELEPHONE NETWORK

CO

A

B

ARTCC

FULLY DIVERSE TRANSMISSION PATHS

- PRIMARY PATH THROUGH RCL CIRCUIT TO TWO ARTCC'S

- SECOND PATH THROUGH ADJACENT ARTCC SHARING THE SAME RADAR
  (LEASED CIRCUIT OR DIFFERENT RCL SEGMENT)

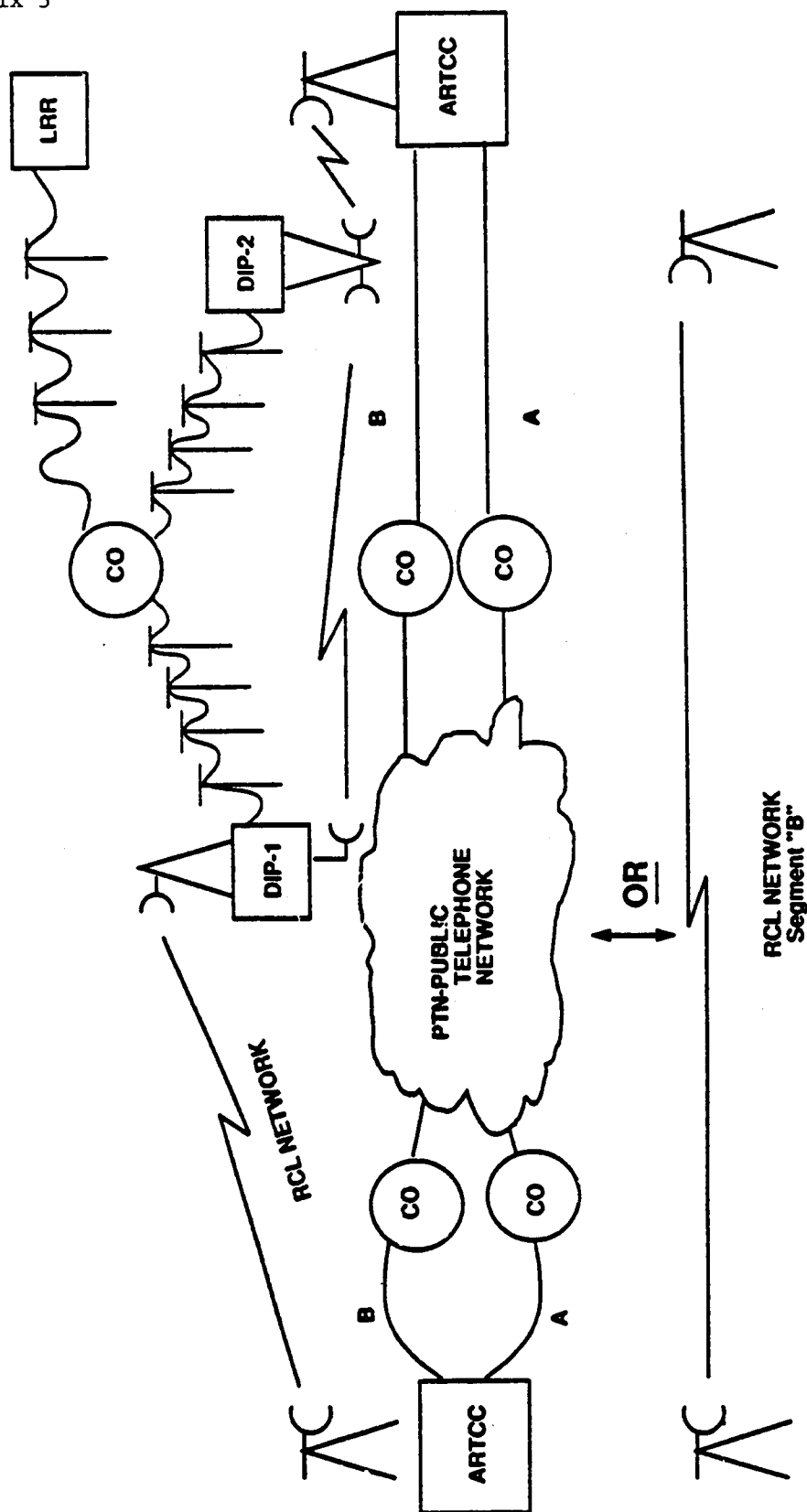- MANUAL PATCHING REQUIRED IF ARTCC'S SHARE MORE THAN ONE RADAR

RDAT/BDAT-LRR NO RCL SPUR
EXAMPLE: LRR-4

LRR

DIP-2

DIP-1

CO

CO

CO

CO

CO

ARTCC

ARTCC

B

A

B

A

RCL NETWORK

RCL NETWORK
Segment "B"

PTN-PUBLIC
TELEPHONE
NETWORK

OR

SINGLE POINT ACCESS TO NETWORK
NO OTHER ALTERNATIVE

- PRIMARY PATH THROUGH LEASED CIRCUIT TO CO TWO SEPERATE DIPS
- SECOND PATH THROUGH RCL (DIFFERENT)
  SEGMENTS FROM PRIMARY
- LOSS OF DATA DETECTED BY A/B FALLBACK SWITCH CAUSING
  ALTERNATE PATH TO BE DETECTED
- MANUAL RESET REQUIRED TO RETURN TO PRIMARY-BOTH ENDS
- AUTO RETURN A/B SWITCHES SCHEDULED FOR MID 1990
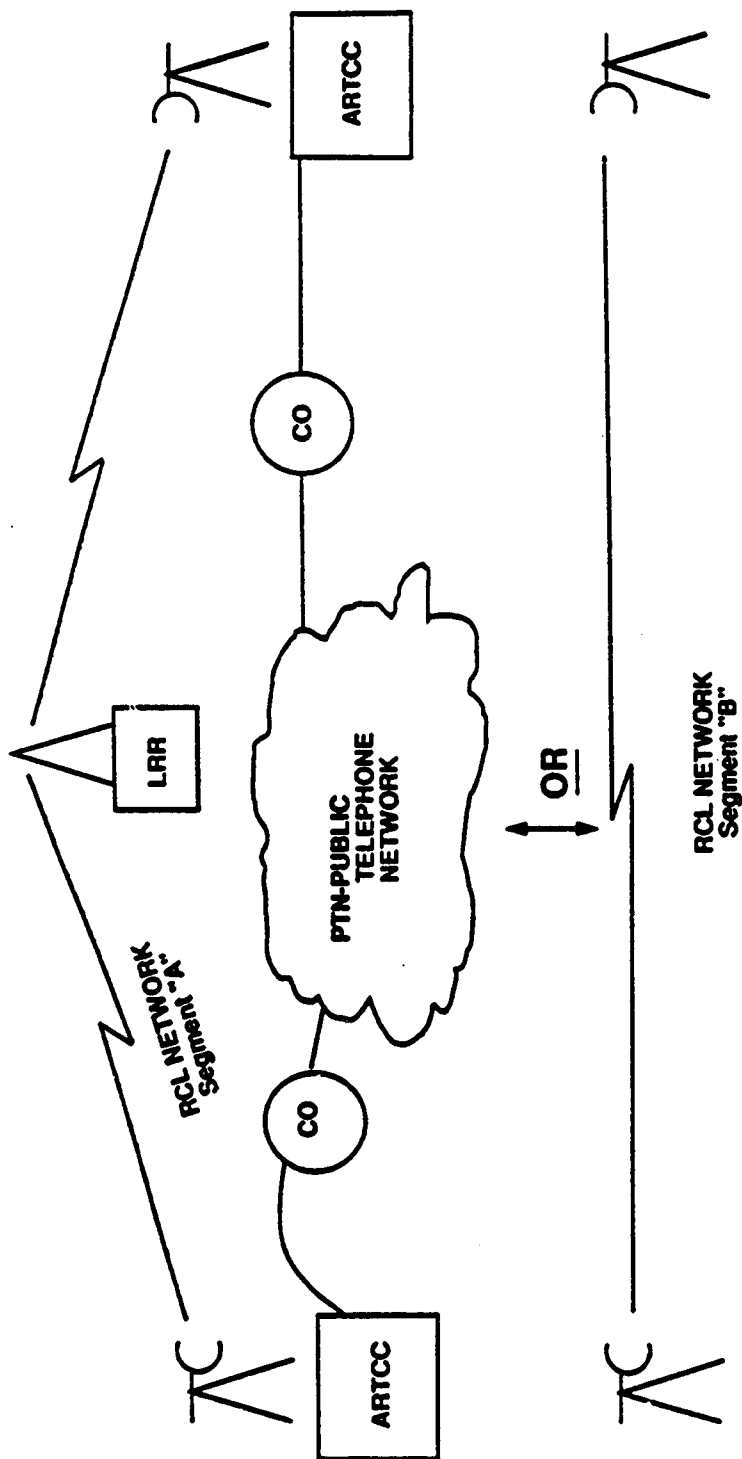
TYPICAL IDAT ARTCC/ARTCC
EXAMPLE: IDAT-1

ARTCC

CO

CO

PTN-PUBLIC TELEPHONE NETWORK

CIRCUIT DIVERSTIY

CO

CO
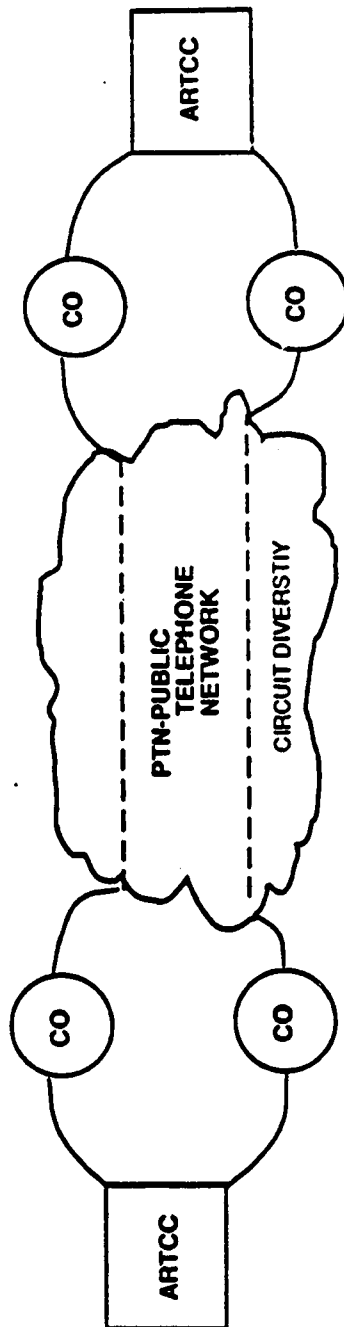
ARTCC

NO RCL AVAILABLE
–REDUNDANT ENTRY TO PTN AT BOTH ARTCC'S
–FULLY DIVERSE SECOND TRANSMISSION PATH

• PRIMARY PATH THROUGH LEASED CIRCUIT
• SECOND PATH THROUGH LEASED CIRCUIT WITH DIVERSE ROUTE
• LOSS OF DATA DETECTED BY A/B FALLBACK SWITCH CAUSING SECOND PATH TO BE DETECTED
• MANUAL RESET REQUIRED TO RETURN TO PRIMARY–BOTH ENDS
• AUTO RETURN A/B SWITCHES SCHEDULED FOR MID 1990

APPENDIX 3. WORKING GROUP CHARTER

TYPICAL IDAT-ARTCC/ARTCC CIRCUIT ROUTING
EXAMPLE: IDAT-2

ARTCC

CO

LRR

RCL NETWORK Segment "A"

CO

PTN-PUBLIC TELEPHONE NETWORK

OR

RCL NETWORK Segment "B"

ARTCC

FULLY DIVERSE SECONDARY

- PRIMARY PATH THROUGH LEASED OR RCL CIRCUIT THROUGH MODEM PORT
- SECOND PATH THROUGH RCL (DIFFERENT) SEGMENTS FROM PRIMARY
- LOSS OF DATA DETECTED BY A/B FALLBACK SWITCH CAUSING SECOND PATH TO BE DETECTED
- MANUAL RESET REQUIRED TO RETURN TO PRIMARY-BOTH ENDS
- AUTO RETURN A/B SWITCHES SCHEDULED FOR MID 1990

IDAT-ARTCC-ARTS
EXAMPLE: IDAT-3

TRACON

CO

B

A

LD RCL NETWORK

PTN-PUBLIC
TELEPHONE
NETWORK

CO

B

A

ARTCC

PRIMARY THROUGH RCL SECONDARY THROUGH PTN

- PRIMARY PATH THROUGH LEASED OR RCL CIRCUIT
- SECOND PATH VIA PTN
- LOSS REQUIRES MANUAL INITIATION OF DIALING SEQUENCE TO ACCESS COMMERCIAL OR FTS
- AUTO DIAL MODEMS ARE CURRENTLY BEING PROVIDED

APPENDIX 3. WORKING GROUP CHARTER

TYPICAL TCOM/ATCT
TRANSMISSION PATH

REMOTE SITE #2

REMOTE SITE #1

CABLE

CABLE

CABLE

ATCT/
TRACON

ATCT
LOOP CABLE

AIR/GROUND REMOTE SITE
INTERCONNECTING CABLES

EXAMPLE